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Research paper

Emotion recognition from faces with in- and out-group features in patients with depression

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ABSTRACT

Background: Previous research has shown that context (e.g. culture) can have an impact on speed and accuracy when identifying facial expressions of emotion. Patients with a major depressive disorder (MDD) are known to have deficits in the identification of facial expressions, tending to give rather stereotypical judgments. While healthy individuals perceive situations which conflict with their own cultural values more negatively, this pattern would be even stronger in MDD patients, as their altered mood results in stronger biases. In this study we investigate the effect of cultural contextual cues on emotion identification in depression.

Methods: Emotional faces were presented for 100 ms to 34 patients with an MDD and matched controls. Stimulus faces were either covered by a cap and scarf (in-group condition) or by an Islamic headdress (niqab; out-group condition). Speed and accuracy were evaluated.

Results: Results showed that across groups, fearful faces were identified faster and with higher accuracy in the out-group than in the in-group condition. Sadness was also identified more accurately in the out-group condition. In comparison, happy faces were more accurately (and tended to be faster) identified in the in-group condition. Furthermore, MDD patients were slower, yet not more accurate in identifying expressions of emotion compared to controls.

Limitations: All patients were on pharmacological treatment. Participants' political orientation was not included. The experiment differs from real life situations.

Conclusion: While our results underline findings that cultural context has a general impact on emotion identification, this effect was not found to be more prominent in patients with MDD.

1. Introduction

For smooth social interactions, the ability to identify emotions from the faces of others is of crucial importance (Adolphs, 1999; Ekman and Friesen, 2013; Frith, 2009). Research in the healthy population has shown that people are generally better at identifying expressions of emotion from their own cultural group (in the following: "in-group") than from other groups (in the following: "out-group") (Elfenbein and Ambady, 2003) and interpret out-group facial expressions as more negative than in-group faces (Hugenberg and Bodenhausen, 2003, 2004). Previous studies have shown that emotion identification performance is affected by age, gender as well as group features (Wallis et al., 2012; Wiese et al., 2008). Belonging to a certain (in-)group might thus affect the identification of facial emotions in others and, consequently, social interactions might suffer from faulty emotion identification when unfamiliar, out-group features are involved. A study comparing emotion identification from faces with light or dark skin colors revealed that prejudice of Caucasian participants was associated with a greater readiness to perceive anger in the dark-colored faces (Hugenberg and Bodenhausen, 2003).

As a consequence of globalization we are increasingly confronted with individuals from different social backgrounds, religions and cultures (Arnett, 2002; Beck, 2000; Rosenmann et al., 2016) and so far there has been very little insight into how this affects the more vulnerable in our communities, e.g. people with mental disorders. The affective state of a person can, however, affect how they judge a situation (Ambady and Gray, 2002).

People suffering from depression oftentimes face profound difficulties in decoding social cues (Bora et al., 2005; Miscowiak and Carvalho, 2014) and interpret stimuli more negatively than healthy individuals (Gur et al., 1992). On the one hand, recent studies indicate that patients with a depression are, for example, faster and more

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accurate in identifying the emotion of sadness in comparison to all other emotions, which suggests a "negative bias" (Gotlib et al., 2004; Joorman and Gotlib, 2006). On the other hand, higher error rates and a slower performance in emotion identification tasks have been shown in patients with a major depressive disorder (MDD) in comparison to healthy controls (Feinberg et al., 1986; Leppänen et al., 2004; Mikhailova et al., 1996; Yoon et al., 2016). It is known that patients with MDD tend to judge emotions more negatively than healthy individuals, but it is yet unclear whether this disposition might have a potential further impact on the reaction to those cultural stimuli which are already negatively evaluated by healthy members of their group (e.g. out-group stimuli). It could be assumed that the negative bias effect might be exaggerated in responses to stimuli that represent out-group features. In a study by Curtis and Locke (2005), individuals with anxious symptoms showed a greater effect of affect-congruence in their evaluation of out-group stimuli compared to control participants. The level of inter-group anxiety is known to amplify individuals' threat appraisal, anger and offensive action tendencies toward out-groups (van Zomeren et al., 2007). Since anxiety as a symptom or a co-morbid condition is frequent among patients with depression (Barlow et al., 1986), such findings could be particularly relevant in this patient group. Neurobiological studies additionally found that damage in the amygdala heightens people's unconscious prejudices (Phelps et al., 2000). In patients with depression, activation abnormalities have been shown in the amygdala (Suslow et al., 2010), altering the perception of emotional stimuli. Moreover, experimentally influencing β-adrenergic receptors has been shown to decrease racial prejudice (Terbeck et al., 2012). Modulating noradrenergic transmission has also been shown to help patients with depression to better identify positive emotions (Harmer et al., 2009). Taken together, a negative bias has been described in patients with depression and additional anxious symptomatology might enhance negative attitudes towards out-groups. Moreover, dysfunctional cerebral/physiological pathways including the amygdala might have an additional altering impact on emotion identification in depression, enhancing prejudiced evaluations.

The eye region plays a key role in the identification of emotions: during the identification of facial expressions, an extended fixation time focusing on the eye-region has been shown (Eisenbarth and Alpers, 2011; Janik et al., 1978). When facial stimuli with in- and out-group features are perceived, the eyes of the in-group faces received more attention than those of the out-group (Kawakami et al., 2014; van Bavel and Cunningham, 2012). When faces are partially covered by a veil, a helmet or some other form of headdress, the observer has to rely on the eye region for the identification of emotions. Kret and de Gelder (2012) previously investigated to what extent emotions can be identified from the eyes when a traditional Islamic veil, a "niqab", compared to a cap-and-scarf combination was covering the face.

With this newly developed paradigm, the authors showed that healthy individuals of Caucasian origin identified fearful expressions faster when the Islamic headdress was covering the face. In contrast, happiness was identified faster in faces with a headdress from the same cultural background. This suggests that the context, including the target face's belonging to a certain group, quickly modulates the interpretation of facial expressions.

In the present study we investigated how patients with an MDD, a group that is characterized by emotion recognition deficits (e.g. Kret and Ploeger, 2015), recognize the expressions of in-group and out-group faces, respectively. The "Niqab Paradigm" was used for the first time to examine the emotional expression identification performance of patients with a current MDD in comparison to healthy controls.

The aim of the study was to identify the suspected influence of a depressed mood on the emotion identification of faces with in-group (cap and scarf) and out-group (niqab) features. We hypothesized that MDD patients would generally show more difficulties identifying emotions regarding detection accuracy and speed than healthy controls. Furthermore, we predicted that the patient group would identify negative emotions faster and more accurately in faces with out-group features than in faces with in-group features. Across both groups, we intended to replicate our earlier findings that the emotion of happiness would be more easily identified in in-group than in out-group faces and that an opposite effect would be observed for fear.

Table 1
Clinical and questionnaire data of MDD patients and healthy controls with mean (M) and standard deviations (SD).

	Patients M (SD)	**Controls** M (SD)	**T**	**p**
Age	38.8 (11.0)	40.3 (10.6)	0.548	0.585
Gender (M/F)	(19/15)	(22/13)		0.558
Duration of illness (years)	2.6 (4.2)	–		
HDRS	15.5 (6.0)	0.6 (1.2)		**< 0.001**
TMT A	30.6 (12.9)	26.5 (8.8)	− 1.540	0.128
TMT B	77.2 (82.0)	61.4 (29.6)	− 1.072	0.287
EQ	28.7 (10.3)	30.6 (12.5)	0.698	0.488
STAI T	60.4 (10.2)	34.1 (6.6)	− 12.712	**< 0.001**
STAI S	48.1 (11.5)	33.9 (7.6)	− 6.038	**< 0.001**
MWT-B	109.0 (12.0)	117.0 (16.0)	2.242	**0.028**
IRI Empathy	38.4 (7.2)	39.3 (5.6)	0.564	0.575
IRI Fantasy	11.4 (3.7)	11.5 (2.8)	0.056	0.956
IRI Empathic Concern	14.3 (2.7)	13.7 (2.3)	− 0.954	0.344
IRI Perspective Taking	12.7 (3.0)	14.1 (2.4)	2.138	**0.036**
IRI Personal Distress	13.0 (2.7)	9.0 (2.2)	− 6.750	**< 0.001**
PANAS Positive	25.0 (6.7)	32.2 (6.7)	4.460	**< 0.001**
PANAS Negative	16.3 (6.4)	12.5 (3.3)	− 3.081	**0.003**
AAS Depend	18.4 (5.2)	11.3 (4.4)	− 6.018	**< 0.001**
AAS Closeness	13.8 (5.2)	10.5 (4.5)	− 2.779	**0.007**
AAS Anxiety	15.0 (3.7)	9.8 (3.1)	− 6.330	**< 0.001**

Note. Abbreviations: HDRS = Hamilton Rating Scale for Depression; TMT = Trail Making Test; EQ = Empathy Quotient; STAI = State-Trait Anxiety Inventory; MWT-B = Multiple Choice Vocabulary Test; IRI = Interpersonal Reactivity Index; PANAS = Positive And Negative Affect Scale; AAS = Adult Attachment Scale.

2. Methods and material

2.1. Participants

Sixty-four patients with an MDD were recruited from the Department of Psychiatry and Psychotherapy at the University of Muenster. All were diagnosed with the Structured Clinical Interview for DSM-IV (SCID-I; First et al., 1996) conducted by a trained clinical psychologist. We included patients with moderate to severe depressive symptomatology as assessed with the Hamilton Rating Scale for Depression (HDRS; Hamilton, 1960). Results of the HDRS showed a medium severity of depressed symptoms in patients during the time of testing, which was significantly higher than in the control sample described below (MDD: mean (M) = 15.5, standard deviation (SD) = 6.1; controls M = 0.6, SD = 1.2; $p < 0.001$) (see Table 1). Thirty patients were excluded from the analysis: eleven patients did no longer meet the DSM-IV criteria for a current MDD at the time of testing, thirteen MDD patients were diagnosed with a comorbid disorder (five anxiety disorders; four posttraumatic stress disorders; two borderline personality disorders; two relevant neurological diseases), two patients aborted the experiment and, finally, four patients had to be excluded due to a technical failure. In total, 34 patients (21 male, 13 female; mean age (M) = 38.8, SD = 11.0, range 19–54 years) who fulfilled the DSM-IV criteria for a current singular or recurrent MDD were included in the study. The sample size is similar to our earlier study (Kret and de Gelder, 2012). All data presented in the following refer to the final sample of 34 patients with an MDD.

Twenty-eight patients received antidepressive medication (eight patients received an SNRI, four patients received an SSRI, four patients received a NaSSA, two patients received an NDRI, two patients received a tricyclic antidepressant, one patient received a MAO-inhibitor, one patient received a mood stabilizer and one patient an atypical neuroleptic; in 13 of these patients, medication was combined with low-dose atypical neuroleptics; three patients were treated with a combination of SNRI, NaSSA and mood stabilizer; one patient received a combination of an SNRI and a melatonin-derivative; one patient received a combination of four medications (SSRI, SNRI, melatonin-derivative and atypical neuroleptic); one patient was treated additionally with low-dose benzodiazepines). Recent electroconvulsive therapy at the time of testing was used as an exclusion criterion.

Thirty-five healthy controls (20 male, 15 female; age: M = 40.2, SD = 10.6, range: 19–55 years), matched for age, gender and education, were recruited. The two groups did not differ significantly in age and gender. Exclusion criteria for both groups included severe internal or neurological disorders, substance abuse, and, in the case of controls, a first-grade relative with a mental disorder. All participants were native German speakers with a Caucasian background and none belonged to the Islamic faith. All had normal or corrected-to-normal vision and were capable of reading six lines error-free on the Snellen eye-chart when standing four feet away. The experimental procedure was approved by the Common Ethics Committee of the Westphalian Medical Chamber and the Westphalian Wilhelms-University Muenster (2012-495-f-S) according to the Declaration of Helsinki (http://www.wma.net/en/30publications/10policies/b3/index.html; last access to all given homepages: 11/19/2017) and written informed consent was obtained from all participants prior to their enrolment in the study.

2.2. Niqab Paradigm

The "Niqab Paradigm" was presented with the program E-Prime (https://www.pstnet.com/eprime.cfm) on a Dell computer with a screen-width of 24 in. Participants were seated at a distance of 20 in. between the eyes and the computer screen. Six female faces from the NimStim Face Stimulus Set (https://www.macbrain.org/resources.htm) were presented, showing four emotion expressions (happy, angry, sad, fearful). The faces were covered with both a fleece cap and a knitted scarf or an Islamic headdress (niqab) (for examples: see Fig. 1**a and b**). The "cap-and-scarf" stimuli formed the in-group condition, while the "niqab" stimuli formed the out-group condition. The headgear templates were taken from the study by Kret and de Gelder (2012). Each image with one of the four emotional expressions was presented in black-and-white to eliminate other out-group effects, as e.g. skin color. Most importantly, in this stimulus set the group context was provided solely by the contextual clothing. That is, the same faces were sometimes shown with in-group and sometimes shown with out-group headdresses. Each emotion was presented to the participants for 100 ms, as previous studies have shown that the strongest contextual effects are obtained with short presentation times (Kret and de Gelder, 2010, 2012). After each image, a gray screen was presented. During this period, the participants were asked to press one of four buttons on a prepared keyboard, indicating the identified emotion. A total of 192 trials were presented in a random order with a short break of one-minute-length after half of the trials.

The participants were instructed to respond as accurately and swiftly as possible for each stimulus. To ensure the fastest possible response, participants were told to keep their fingers on the buttons. They were also asked to answer even if they were not able to identify the emotion. The procedures of the experiment were explained verbally as well as via written instruction on the computer screen before the test was started.

2.3. Cognitive testing and questionnaires

Cognitive testing included the Trail Making Test A and B (TMT; Reitan, 1958) and the Mehrfachwahl-Wortschatz-Intelligenztest (Multiple Choice Vocabulary Intelligence Test (MWT-B); Lehrl, 1977). TMT A and B measure executive functions and cognitive processing speed. The MWT-B is a test that challenges crystallized intelligence on the basis of verbal capacities. The participants' present affect was measured by the Positive And Negative Affect Scale (PANAS; Krohne et al., 1996; Watson et al., 1988). Participants had to rate ten positive and ten negative emotions on a five-point Likert scale that corresponded to their

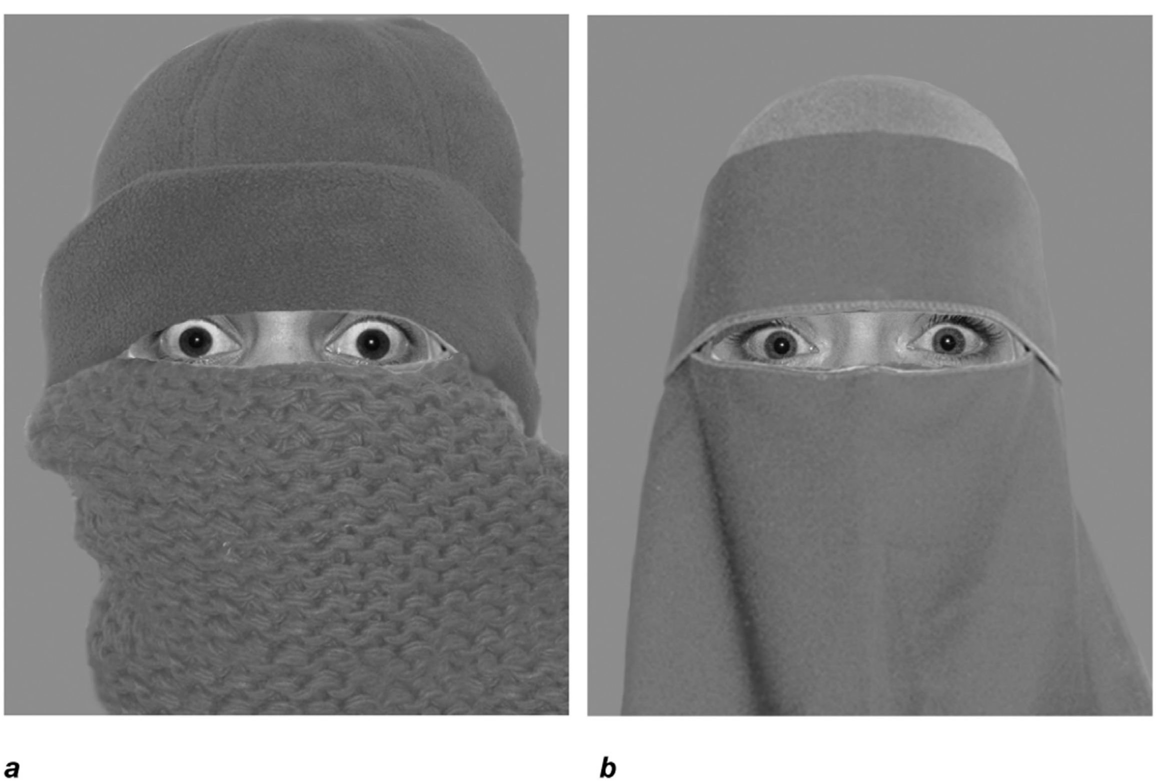

Fig. 1. Example stimuli. a: Cap and scarf (fearful) condition. b Niqab (fearful) condition.

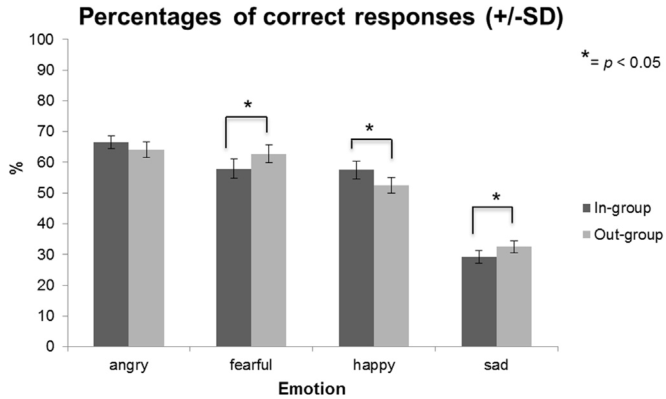

Fig. 2. Mean percentages of correct responses (%) of all participants (patients with MDD and controls) in in-group and out-group conditions. Fearful and sad faces were recognized with a higher accuracy in the out-group condition. Happiness was recognized with a higher accuracy in the in-group condition.

feelings during the last year. The Adult Attachment Scale is an instrument for self-description of attachment styles, namely “secure”, “anxious” and “avoidant” (AAS; Collins and Read, 1990, German translation Schmidt et al., 2004). From these styles, three scores were deferred: the “closeness” score indicates stronger feelings of comfort with closeness and intimacy. The “anxiety” score points at worries about being rejected or unloved. Lastly, the “depend” score indicates more comfort with depending on others and a belief that others will be available when needed. To identify empathy abilities, the German version of Interpersonal Reactivity Index was used (IRI; Davis, 1983; Davis, 1980; German version Saarbruecker Persoenlichkeitsfragebogen; Paulus, 2006). This scale features four sub-scores, i.e. perspective taking (PT), fantasy (FS), empathic concern (EC) and personal distress (PD). The PT score measures the tendency to spontaneously adopt the psychological point of view of others, while the FS score assesses the ability to imagine the emotional status of fictional characters. The EC score assesses "other-oriented" feelings of sympathy and concern and the PD sub-score measures "self-oriented" feelings of personal anxiety and unease in tense interpersonal settings. In the German version, a general empathy score can be calculated. The Empathy Quotient (EQ; Baron-Cohen and Wheelwright, 2004) measures empathic abilities in adults. The State-Trait Anxiety Inventory (STAI S and T; Spielberger et al., 1970) was applied to identify current or habitual anxiety.

According to the results of the PANAS, patients with an MDD had significantly higher negative and lower positive affect scores than healthy controls. In addition, patients with an MDD showed both significantly higher trait and state anxiety than healthy controls. Regarding the empathy scale (IRI), patients with an MDD showed significantly higher distress levels than the control group. On the attachment style measure (AAS), patients scored significantly higher on the “depend” and the “anxiety” sub-scales than the healthy controls. For detailed results of the clinical and questionnaire data including significant group differences, please refer to Table 1.

2.4. Statistical analysis

We conducted a Generalized Linear Mixed Models approach, using the reaction time (RT) and the accuracy (Acc) as dependent variables (see also Kret and de Dreu, 2013; Kret and de Gelder, 2013). We used a multilevel model for nested data as it has several benefits. The first advantage, e.g. in contrast to an ANOVA, is that the method can handle missing data points without losing any data. A second, considerable benefit is that all data can be included in the model without having to average over experimental conditions. A third advantage is that nested data is accounted for: variance in the patient data can be captured by including a random intercept for subjects. Because this method allows the inclusion of random factors, more variance in the data can be explained, making this a very powerful and precise method. For the emotion identification decisions, the multilevel structure was defined by the different trials nested within the participants. Fixed effects were the groups (patients, controls), emotion condition (angry, fearful, happy, sad), in-group/out-group condition (niqab, cap-and-scarf) and the interactions group × emotion condition, group × in-group/out-group condition, in-group/out-group condition × emotion condition and group × in-group/out-group condition × emotion condition. To improve the model fit, non-significant factors were dropped one by one, beginning with the higher order interactions. The model fit was tested via a log likelihood test to determine a significant improvement or worsening of the new model. The different image stimuli (actors) were defined as a random factor. All models included a random intercept per subject. Correlational analyses were conducted with Pearson product-moment correlations.

The statistical analyses were performed with the software SPSS (version 23.0 for Windows) by IBM. The level of significance was set at $\alpha = 0.05$.

To reduce the rate of guessed responses, only RTs between 400 and 2.500 ms were included in the analysis. Moreover, only correct responses were included in the multilevel analysis of the RTs. As age strongly influences the identification performance and leads to lower accuracy rates and to longer RTs (Demenescu et al., 2014; Ruffman et al., 2008; Sullivan and Ruffman, 2004), age was used as a covariate in all analyses.

3. Results

3.1. Accuracy/performance

The multilevel analysis including the factors group, emotion and in-group/out-group and their interactions revealed a main effect of emotion (F (3, 13237) = 387.853, $p < 0.001$), showing that sadness was recognized the least accurately (see Fig. 2). An interaction effect of in-group/out-group and emotion (F (3, 13237) = 7.122, $p < 0.001$) was identified. Replicating our earlier findings, fearful faces were more often correctly identified in the out-group than in the in-group condition (F (1, 12371) = 8.719, $p = 0.003$). Also, sad faces were more often correctly identified in the out-group than in the in-group condition (F (1, 12371) = 3.948, $p = 0.047$). In contrast, the happy facial expressions were significantly more often correctly identified in the in-group condition, which also corresponds with our earlier study (F (1, 12371) = 9.885, $p = 0.002$) (see Fig. 2). The percentage of correct answers in the patient group was similar to that of the control group (F (1, 12371) = 0.290, $p = 0.590$) (see Fig. 3).

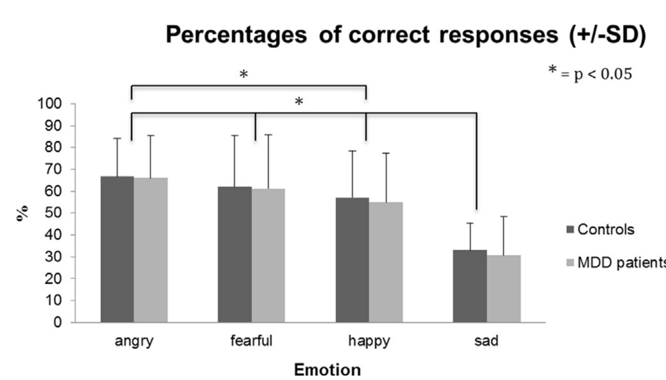

Fig. 3. Mean percentages of correct responses (%) of patients with MDD and controls for all emotions. Sadness was recognized significantly worse in comparison to all other emotions. Anger was recognized significantly better in comparison to happiness. The percentages of correct responses did not differ significantly between the two groups.

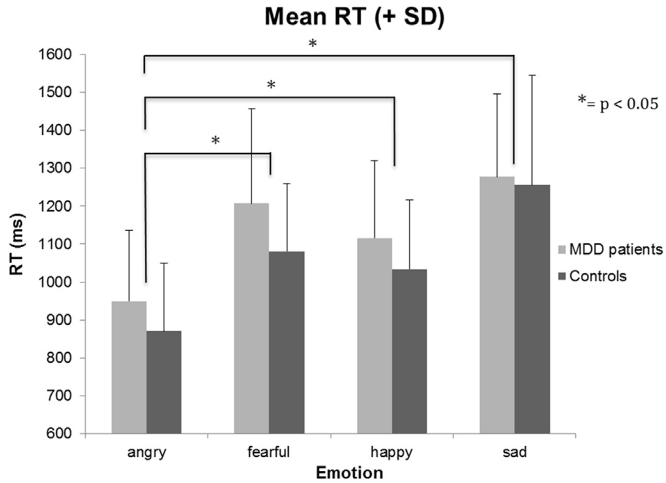

Fig. 4. Mean reaction times (RT in ms, SD) of patients with MDD and healthy controls for all emotions. The emotion anger was recognized fastest in comparison to all other emotions. Patients with MDD were generally slower than healthy controls over all emotion items.

3.2. Reaction times (RT)

We identified a significant main effect of emotion (F (3, 6908) = 266.011, $p < 0.001$). A pair-wise comparison revealed shortest RTs in both patients and controls regarding the angry faces (M = 877 ms, SD = 351). In contrast to the other emotions, sad faces were identified the most slowly (M = 1.252 ms, SD = 437.0). As revealed by a main effect of group, RTs were significantly longer for the patients with MDD than for the controls over all emotions (F (1, 6908) = 5.114, p = 0.024, see Fig. 4). There was no significant interaction between group and emotion condition (see Fig. 4). In addition, the interaction of in-group/out-group and emotion condition was significant (F (3, 6908) = 3.304, p = 0.019), showing that the emotion fear was identified faster when faces with out-group features were presented (F (1, 6908) = 5.481, p = 0.019). Happiness was, in tendency, faster identified from faces with in-group features (F (1, 6908) = 3.668, p = 0.056) (see Fig. 5).

3.3. Correlational analysis

In patients with an MDD, neither detection accuracy (r = 0.142, p = 0.423) nor RT (r = − 0.078, p = 0.661) correlated with HDRS scores.

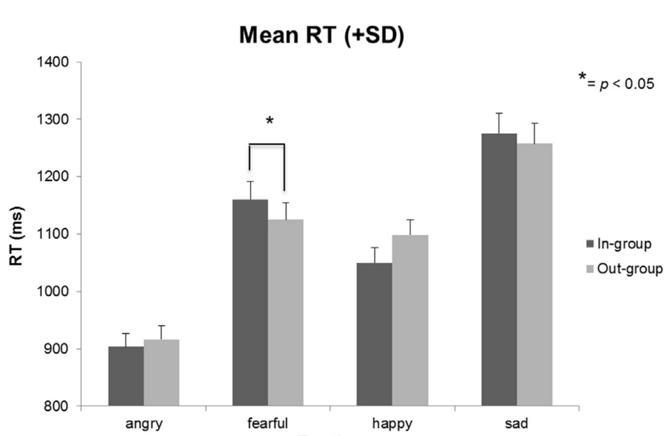

Fig. 5. Mean RT regarding the in-group and out-group condition for all emotions. Fear was recognized significantly faster in faces with out-group features.

4. Discussion

In this study we investigated whether patients with an MDD are differently influenced on their emotion recognition performance by an in-group vs. out-group context, compared to healthy controls. Over both groups we showed that fear was recognized faster and with a higher accuracy in faces that were partly covered by a headdress, which signaled out-group. Also, sadness was recognized with a higher accuracy in the out-group condition. Furthermore, happiness was recognized with a higher accuracy and, in tendency, faster in in-group faces. These results are in line with previous findings on emotion identification from in- and out-group faces. Our study suggests that in Western civilization more positive emotions are associated with the perception of a cap and scarf than compared to the perception of a niqab. Whereas Kret and de Gelder (2012) showed a tendency of significance, we confirmed that participants are significantly better at recognizing fear in out-group than in in-group faces. Moreover, in contrast to the findings of Kret and de Gelder (2012) we found a significantly better recognition performance of sad expressions in out-group faces compared to in-group faces. A study of Fischer et al. (2012) also compared the emotion identification performance for faces covered by two black bars and faces covered by a niqab. Happiness was better recognized in the partial face condition compared to faces covered by a niqab by participants of a Western cultural background. In line with our own results, it can be assumed that the Islamic context leads to a reduced accuracy of recognition of happiness in faces.

We found that the performance of patients with an MDD was significantly slower than the performance of healthy controls over all emotions. We could not, however, identify a disadvantage of emotion identification in relation to out-group stimuli that exceeded that of healthy controls. Significantly slower reaction times of patients with a depression on emotion identification tasks have also been shown in previous studies (Cooley and Nowicki, 1989; Leppänen et al., 2004; Li et al., 2016; Yoon et al., 2016). Nevertheless, slower perception of emotions carries the risk of failing to perceive important information (e.g. danger) and might lead to greater insecurity, which could facilitate the development of an anxiety disorder (Pine et al., 2005; Suslow et al., 2004).

Several limitations of our study should be mentioned. Our patient sample was mostly on pharmacological treatment with antidepressants. Studies have shown that the use of antidepressants in healthy participants supports the perception of positive emotions (Stein et al., 2012). This might be the reason for the similar performance on accuracy of emotion perception between patients with an MDD and controls. An unmedicated group of MDD patients might perform less well on emotion identification accuracy. Furthermore, we did not consider participants' political orientation, which might be a predictor of attitude towards the niqab (Fischer et al., 2012). Fischer et al. (2012) described in their study a correlation between the political orientation (left and right wing) and attitudes towards women who wear niqab. Moreover, in our study, only white Caucasian female faces were used, covered either with a cap and scarf or a niqab. Here, we focused solely on headdress as a cultural feature. Skin color and facial physiognomy were not considered. However, in real-life situations these factors, as well as language (Lindquist et al., 2015) and gestures, play a crucial role in our social interaction with individuals from different cultures (Stepanova and Strube, 2012). An analysis of errors over both groups revealed low classification accuracy for sad faces in comparison to the other emotions. Frequent misclassification of sad emotional faces as happy or fearful ones has been identified in previous studies (Du and Martinez, 2011; Kret and de Gelder, 2012). The short presentation time (max. 100 ms) or the static (vs. dynamic) pictures of the faces might explain the high error rates, as classification accuracy has been shown to be dependent on these factors (Kamachi et al., 2013; Recio et al., 2013).

Our results show that emotion identification is impacted and also facilitated (reaction time) by features of in- and out-groups. While the eye region, which is crucial for the interpretation of emotions, is equally perceivable in both stimulus conditions, negative emotions might have been attributed faster to stimuli with out-group features. Whether this relates to a general negative attitude of participants to Islam or not cannot be judged from our findings. This line of research would need to be extended by stimuli with features of other cultures. Additionally, it would be worthwhile to investigate a group of participants with an Islamic background. Here, it would be interesting to investigate whether the pattern of emotion identification would be inverse to the pattern exhibited by the sample of Caucasian origin without Islamic faith. Our results show nonetheless that emotion identification can be inhibited when out-groups are involved, which in turn might lead to interactional difficulties and misunderstandings. Our hypothesis that this might also be true to a higher extent for patients with depression was not corroborated. Patients showed an overall slowing, which has been described in literature (Li et al., 2016), but no overly stereotypical judgments. Moreover, there was no correlation between accuracy of performance and severity of depression. Also, when including MDD patients with a comorbid disorder, the results were stable. While we used a sufficiently large sample, as did similar studies (Suslow et al., 2001), it is doubtful whether higher levels of depression would yield different results. Interestingly, not depression severity but other features, e.g. personality styles, might have an impact on emotion identification abilities. Further research should explore this topic in more depth in the future.

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